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UNDERSTANDING STEM MAJORS' INTENT TO STUDY ABROAD

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According to the Institute for International Education (IIE, 2013a), study abroad participation in the United States had almost doubled over the past decade, but still only a small fraction of U.S. college students study abroad. Students in certain academic majors, particularly those majoring in STEM fields, often face specific barriers to studying abroad (Desoff, 2006; IIE, 2014b, Wainwright et al., 2009). This study sought to unpack the role of college environments in promoting or inhibiting study abroad participation by examining the interplay of academic major, gender, and class standing as predictors of student's intent to study abroad.

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Over the past decade and a half, a wide array of higher education organizations including the American Council on Education (e.g. ACE, 2002, 2011), The Association of American Colleges and Universities (e.g. Campbell, 2011; Howland, 2005), NAFSA: Association of International Educators (e.g. NAFSA, 2006), and even the U.S. Federal Government Accountability Office (GAO, 2007) have called on institutions of higher education to find ways to internationalize U.S. higher education. According to a recent report from the American Council on Education (2011),

Higher education exists in, and is very much affected by, a world that increasingly operates across sovereign borders. Just as countries have become more interconnected worldwide, so, too, have colleges and universities... In the 21st century, higher education is explicitly, and fundamentally, a global enterprise. (p. 5)

In recognition of the fundamentally global nature of education in the 21st century, and in an effort to increase students' abilities to function in an increasingly interconnected world (Reimers, 2014), institutions of higher education in the United States have engaged in numerous internationalization strategies, including recruiting international students and faculty, forming cross-border partnerships, and engaging in efforts to internationalize the curriculum (ACE, 2012).

This recent emphasis on internationalization is also reflected in efforts to increase U.S. student participation in study abroad (e.g., The Commission on the Abraham Lincoln Study Abroad Fellowship, 2005; Generation Study Abroad, Institute for International Education, 2014a). According to the Institute for International Education's (IIE) 2011 and 2013 *Open Doors* reports, study abroad participation in the United States has almost doubled in just over a decade, from 143,590 students in 1999/2000 to 283,332 students in 2011/2012 (IIE, 2011, 2013a). While these gains are considerable, that number is still only a fraction of the over

21.5 million students enrolled in higher education in the U.S. (National Center for Education Statistics, 2011). Additionally, not all students are participating in study abroad in equal numbers. For example, approximately 64.8% of students who study abroad are women, 76.4% are White, and over half are majoring in the social sciences, business, or humanities. These statistics have not changed by more than a few percentage points over the past decade, despite gains in the overall numbers of students studying abroad (IIE, 2013a, 2013b).

A number of researchers have sought to understand the factors that predict study abroad intent and participation (Salisbury, Umbach, Paulsen & Pascarella, 2009; Stroud, 2010), but more research is needed to understand who does and does not study abroad and why. One factor of particular interest to student affairs professionals that has yet to be fully explored is the role of the college environment in fostering or inhibiting students' desire to study abroad. Research on intent to study abroad has typically focused on academic major as a measure of the college environment, and findings have been mixed. Some studies have found major to be a significant predictor of intent to study abroad (Stroud, 2010), while others have found no such relationship (Salisbury et al., 2009). It is clear, however, that students in some academic disciplines, and in particular those majoring in science, technology, engineering, and mathematics (STEM fields), face specific barriers to studying abroad (Desoff, 2006; IIE, 2014b; Wainwright et al., 2009), pointing to the need for more research on the relationship between academic major and intent to study abroad. As such, the purpose of this study was to unpack the role of college environments in study abroad participation by examining the interplay of academic major, gender, and class standing as predictors of students' intent to study abroad.

Review of the Literature

In order to understand STEM majors' intent to study abroad and the relevance of this topic to the field of student affairs, in the following sections we provide an overview of relevant prior literature. First we discuss evidence of positive student learning and development through study abroad and what role student affairs educators have in promoting study abroad participation. Next we discuss the importance of study abroad and global learning for STEM majors specifically, and finally review prior literature on predictors of intent to study abroad generally.

Study Abroad and Student Affairs

The low numbers of U.S. students studying abroad and the disparity in the participation rates of various groups of students is particularly troubling for student affairs professionals due to the potential for study abroad to contribute to positive outcomes for students. An extensive body of research on outcomes related to study abroad programs have shown that students who participate in study abroad may improve their intercultural sensitivity (Carter, 2006; Sample, 2012) and knowledge and understanding of other cultures (Bates, 1997; Williams, 2005), show greater appreciation for cultural differences (Bates, 1997) and openness to diversity (Black & Duhon, 2006; Forgues, 2005), and learn to empathize with people from different cultures (Willard-Holt, 2001). In addition to cultural learning, students who study abroad have been shown to have a greater understanding of global interdependence (Sutton & Rubin, 2004) and are more interested in political and international affairs (Carson, Burn, Useem & Yachimowicz, 1990). Study abroad also contributes to students' own personal development through encouraging students to question their own beliefs (Forgues, 2005) and improving students' flexibility and adaptability (Black & Duhon, 2006; Willard-Holt, 2001; Williams, 2005), emotional resilience and personal autonomy (Black & Duhon, 2006),

and self-awareness and confidence (Willard-Holt, 2001).

As members of a field dedicated to facilitating student learning and development, promoting study abroad should be of particular interest to student affairs professionals. Those with training in student affairs can play key roles in supporting study abroad programs, including assisting with risk management and cultural learning (Higum, 2014; Rader, 2014), and planning pre-departure orientation sessions (Higum, 2014) and post-return reorientation programs (Young, 2014). Even more importantly, however, student affairs professionals play a key role in promoting educational environments that facilitate engagement for all students (Harper & Quayle, 2015; Kuh, 2009, 2015). As such, understanding the factors that facilitate or inhibit engagement in high-impact engagement practices such as study abroad is particularly relevant to the work of student affairs professionals.

Study Abroad and STEM Majors

While study abroad and global learning have often been perceived to be the domain of liberal arts or foreign language education, in recent years increasing attention in the United States has been paid to the need for students in STEM majors to develop the skills and competencies often associated with study abroad (Campbell, 2011; Nair, 2011). According to Wainwright, Ram, Teodorescu and Tottenham (2009), scientists today "come from many different countries and collaborate across national borders on problems that do not respect state boundaries. Science is truly global and the new scientist has to be equipped to succeed in an international and intercultural environment" (p. 382). This sentiment is echoed in the 2014-2018 National Science Foundation Strategic Plan, which noted the importance of "prepar[ing] a diverse, globally competent STEM workforce" (NSF 2014, p. 6) to meet societal challenges that are increasingly global in nature.

Unfortunately, STEM majors in the Unit-

ed States are not participating in study abroad at the same rate as their non-STEM peers (IIE, 2013a) due to a number of real and perceived obstacles in STEM disciplines. STEM majors often have a more rigid structure of required, sequential courses, making it difficult for students in those majors to be away from campus for a semester at any point during their college career. This rigid academic structure also may not leave much time for electives, and many STEM departments do not allow students to take required courses abroad (Wainwright et al., 2009). Many students in STEM majors intend to continue on to medical school, adding an extra layer of required, sequential courses, in addition to studying for the MCAT and scheduling medical school interviews. Students in these majors also may not have time for foreign language study, restricting their study abroad options, and faculty may discourage (or at least fail to encourage) study abroad, often because they do not see the educational value of such experiences (Desoff, 2006; Wainwright et al., 2009).

Understanding Intent to Study Abroad

If student affairs professionals are to increase participation in study abroad for all students, it is first important to understand the factors that influence students' intentions to study abroad. As Stroud (2010) described, "understanding intent to study abroad will facilitate efforts to *actualize* intent among students—an important key to increasing the participation rate of U.S. college students" (p. 493). Mirroring the college choice process, Salisbury et al. (2009) described a three-step process by which students decide whether or not to study abroad – "the development of the predisposition or intent to study abroad, the search for an appropriate study abroad program, and the selection of and departure for a particular location and program" (p. 124).

Examining U.S. freshmen students' intent to study abroad, Salisbury et al. (2009) found that men were significantly less like-

ly to intend to study abroad than women, and that students identifying as Asian Pacific Islander were less likely to intend to study abroad than White students. Many of their other findings, however, did not parallel actual participation numbers. For example, there were no significant differences between White students and either African American or Latino/a students, and there was no difference between humanities and STEM majors.

With the lower study abroad participation of students in STEM majors, the fact that Salisbury et al. (2009) did not find majoring in these fields to be a significant negative predictor of intent to study abroad is quite surprising. As the authors hypothesized, "this may reflect the impact of curricular differences across actual majors that affect students when they are further along in their academic experiences and in their decision-making regarding study abroad" (p. 631). As Salisbury et al.'s study focused on freshmen students, the differences in intent to study abroad may not have yet occurred. College environments may, in fact, have negative influence on intent to study abroad. A recent study by the American Council on Education (ACE, 2008) found that 55% of college-bound high school seniors answered that they were at least fairly certain that they would study abroad. As only approximately 2% of U.S. college students actually study abroad, something may be happening during the first few years of college that prevents students from maintaining and acting on these intentions.

One factor that may account for the disparity in study abroad participation by major is gender. It is possible that since men are less likely to study abroad than women, and men are also more likely to major in STEM, the underrepresentation of STEM majors in study abroad may simply be attributable to gender differences. However, in a follow-up to their original study on intent to study abroad, Salisbury, Paulsen, and Pascarella (2010) explored gender differences in predictors of intent to study abroad, and

found more complex patterns of interaction between gender and major. For example, women majoring in the social sciences were significantly more likely than their peers in humanities to intend to study abroad. Similarly, men who were undecided or in "other" majors were more likely than men majoring in the humanities to intend to study abroad.

While both of these studies have provided important insight into the factors that predict students' intentions to study abroad, they only consider freshmen students. As most students who study abroad do so in their junior and senior year (IIE, 2013b), it is also important to explore what happens to students' intentions during college in order to identify the disconnect between high school students' high levels of intent to study abroad (ACE, 2008) and the low levels of actual college student participation.

Purpose and Research Questions

The purpose of this study was to explore what happens to U.S. students' intent to study abroad during the first two years of college by examining the interplay of academic major, gender, and class standing. As students in STEM majors are underrepresented in actual study abroad participation, this study focuses primarily on differences between STEM and non-STEM majors, as well as differences within various STEM majors fields. Specifically, this study sought to answer the following research questions:

1. Do the odds of intending to study abroad differ between freshmen and sophomore students?
2. Do the odds of intending to study abroad differ between STEM and non-STEM majors, and within different STEM major fields?
3. Do the odds of intending to study abroad differ based on gender?
4. To what extent is the difference in intent to study abroad between freshman and sophomore students different for men and women and for students in various STEM major fields?
5. To what extent is the difference in in-

tent to study abroad between men and women different for different STEM major fields?

Methods

Sample

This study used data from the 2007 National Study of Living Learning Programs (NSLLP), a multi-institutional survey designed to explore the effect of living learning programs (LLPs) on undergraduate students in the United States. While the purpose of this particular analysis is not to examine outcomes related to LLPs, this data set is relevant because it included information on intent to study abroad and academic major, and is a large data set including 22,519 respondents from 49 campuses in the United States. The NSLLP used a web-based survey with an overall 20.9% response rate. Students who were invited to participate in the survey were either participants in LLPs or part of a comparison group selected based on gender, race/ethnicity, class level, and residence hall assignment to match as closely as possible the living-learning program group (Inkelas et al., 2007). The reliability and validity of the NSLLP survey was established through review by content and survey methodology experts, pilot testing, and statistical analysis of reliability (see Inkelas et al., 2006 for more details).

As this study examined intent to study abroad, and most U.S. students who do study abroad do so during their junior or senior year (IIE, 2013b), a sub-sample of freshmen and sophomore students was extracted from the overall NSLLP data set for this analysis. This group is particularly important to study, as the first two years of college are key in fostering participation in study abroad (IIE, 2014b). This resulted in a total sample of 19,144 students, including 14,353 freshmen and 4791 sophomores. While freshmen students make up the majority of this sample, the inclusion of this sufficiently large number of sophomores allows for the exploration of differences in intent to study abroad between freshmen

and sophomores. Within this sample, 9.4% were enrolled at baccalaureate and master's universities, 3.0% at research universities, 28.1% at research universities with high research activity, and 59.4% at research universities with very high research activity. Additionally, 53.3% of students participated in LLPs, 56.5% identified as female, 24.6% were STEM majors (8.8% biological sciences, 11.4% engineering, 1.4% mathematics and statistics, and 3.0% physical sciences), and 75.1% identified as White, 7.5% Asian Pacific Islander, 6.1% African American, 6% Multiracial, 3.9% Hispanic, .2% American Indian, and .8% other.

Data Analysis

First, logistic regression analysis was used to identify significant group differences in intent to study abroad between freshman and sophomore year (Research Question 1), STEM and non-STEM majors (Research Question 2), and men and women (Research Question 3). Second, all two-way interaction terms of for major, gender, and class standing were added to the logistic regression analysis to explore the interaction of these variables in predicting students' intent to study abroad. The interaction terms were used to determine if the difference in

intent to study abroad between freshmen and sophomore year varied based on gender or major (Research Question 4), and if the difference in intent to study abroad between men and women varied based on major (Research Question 5).

The dependent variable, students' intent to study abroad, was coded as 0=does not intend to study abroad, 1=does intend to study abroad. The independent variables were major, gender (0=male, 1=female), and year in school (0=freshman, 1=sophomore). In order to explore differences within STEM majors, each major within STEM fields (Engineering, Physical Sciences, Biological Sciences, and Mathematics and Statistics) was dummy coded against the non-STEM major referent group for the logistic regression analysis (see Table 1).

It is important to note that this study focuses on gender rather than biological sex; as such, throughout the literature review and purpose statement we referred to "men" and "women," rather than "males" and "females," and will again use this terminology in the discussion. However, the NSLLP asked students to identify their gender as "male," "female," "transgender," or "other." In order to accurately reflect the responses that students selected on the sur-

Table 1. Independent Variable Coding

Dependent Variable	Category	Coding
Major (Referent group = non-STEM majors)	Biological Sciences	Biological Sciences = 1
		Other = 0
	Physical Sciences	Physical Sciences = 1
		Other = 0
	Mathematics and Statistics	Mathematics and Statistics = 1
		Other = 0
	Engineering	Engineering = 1
		Other = 0
Gender	Female	1
	Male	0
Year in School	Freshmen	0
	Sophomore	1

vey, throughout the methods and results we have used the terminology used in the NSLLP instrument.

Limitations

It is important to note that the NSLLP data set may not be representative of all U.S. college students, as there is an overrepresentation of students in LLPs who may also be more inclined to participate in other campus activities (such as study abroad). The comparison group was chosen to match the LLP group as closely as possible, so also may not be representative of the larger college student population. While this limits the generalizability of the results to all college students, the results are most applicable to students most likely to study abroad. As such, the implications for practice are particularly relevant.

This sample is also dominated by students at research universities, which is particularly important to note in light of the focus on academic major. It is likely that the environments experienced by a student majoring in STEM at a large research university are substantially different than those experienced by a STEM major at a small liberal arts college, and those differences may have implications for the effect of academic major on intent to study abroad. While this again limits the generalizability of the findings to students across institutional types, research universities are particularly important to study in this context as the STEM major environments may be those least conducive to promoting study abroad.

Additionally, Salisbury et al.'s (2009) landmark study on predicting student intent to study abroad used a sample dominated by students at liberal arts colleges. As the focus of this study is on a different student population, it can illuminate key differences in intent to study abroad between these two types of institutions.

Additionally, while examining class standing as a variable can illuminate possible changes over time, this study relies on cross-sectional data rather than longitudinal data on the same students in their freshman and sophomore years. It is possible that the differences found related to class standing are not due to change over time and rather to other differences between the two groups of students. Finally, this study does not include a number of variables that have been shown to be associated with intent or participation in study abroad, such as race and socioeconomic status. As such, it should be seen as a preliminary exploration of group differences in intent to study abroad during the first two years of college, rather than as providing a comprehensive model to predict such intent.

Results

The results of this study showed that overall, 53.2% of freshmen and sophomore students intended to study abroad. With regards to major, 45.9% of STEM majors and 55.6% of non-STEM majors intended to study abroad. Within the STEM majors, 55% of biological sciences, 39.9% of engineering, 45.6% of mathematics and statis-

Table 2. Intent to Study Abroad by Major

	Intent to Study Abroad	
	Yes	No
STEM Majors (overall)	45.9%	54.1%
Biological Sciences	55.0%	45.0%
Physical Sciences	41.7%	58.3%
Mathematics & Statistics	45.6%	54.4%
Engineering	39.9%	60.1%
Non-STEM Majors	55.6%	44.4%

tics, and 41.7% of physical sciences majors intended to study abroad (see Table 2). With regards to gender, 45.9% respondents who identified as male and 58.7% respondents who identified as female intended to study abroad. With regards to class standing, 55% of freshmen and 47.9% of sophomores intended to study abroad.

Block 1 of the logistic regression analysis found both class standing and gender to be significant predictors of intent to study abroad (see Table 3). The odds of intending to study abroad were greater for those identifying as female than for those identifying as male ($\exp(\beta)=1.558$, $p<.001$), and less for sophomore than for freshmen ($\exp(\beta)=.738$, $p<.001$). Interestingly, the regression analysis uncovered unexpected results within STEM major fields. Even controlling for the effect of gender and class standing, physical sciences ($\exp(\beta)=.631$, $p<.001$), engineering ($\exp(\beta)=.620$, $p<.001$), and mathematics and statistics ($\exp(\beta)=.706$, $p=.009$) majors were all significant negative predictors of intent to study abroad, but majoring in biological sciences was not significant ($\exp(\beta)=.978$, $p=.690$), indicating that students majoring in the biological sciences are no more or less likely to intend to study abroad than students majoring in the humanities.

The interaction terms in the logistic regression model also illuminated interesting significant effects. First, there was a significant negative interaction between class standing and gender, indicating that while for those identifying as both male and female, the odds of intending to study abroad as sophomores were lower than the odds for freshmen, this difference in intent to study abroad between freshman and sophomores was even greater for those identifying as male as those identifying as female. Table 4a lists the actual percentages of students intending to study abroad by gender and class standing. The interaction effect is difficult to see based on these percentages, so the odds of intending to study abroad were calculated and are presented in Ta-

ble 4b. From this table it can be seen that while the odds of intending to study abroad for freshmen identifying as female is 1.393 times greater than the odds for freshmen identifying as male, the odds of intending to study abroad for sophomores identifying as female is 1.496 times greater than the odds for sophomores identifying as male – the gap between the genders has widened. Put another way, freshmen identifying as female have 1.149 times greater odds of intending to study abroad than do sophomores identifying as female, but for those identifying as male that odds of intending to study abroad as freshmen is 1.234 times greater than the odds as sophomores – the gap between the two classes is wider for those identifying as male than for those identifying as female.

Similarly, there were significant negative interaction effects between major and class standing for physical sciences and biological sciences majors. While there is a difference between the freshmen and sophomore year in intent to study abroad for almost all majors, this difference was greater for physical sciences and biological sciences majors than it was for non-STEM majors. Interestingly, there was a significant positive interaction effect between major and class standing for mathematics and statistics majors. In fact, the probability of intending to study abroad for sophomore mathematics and statistics majors was actually greater than the probability for freshmen in these majors (See Tables 5a and 5b).

For engineering majors there was no significant interaction between major and class standing, but there was a significant negative interaction between major and gender. For students in engineering, the gap in intent to study abroad between those identifying as male and those identifying as female was smaller than for non-STEM respondents (See Tables 6a and 6b). No other majors showed a significant interaction with gender.

Table 3: Predictors of Intent to Study Abroad

	Block 1: Main Effects			Block 2: Main Effects & Interaction Effects		
	Parameter Estimate	Standard Error	Odds Ratio	Parameter Estimate	Standard Error	Odds Ratio
Physical Sciences	-.460****	.093	.631	-.467****	.135	.627
Biological Sciences	-.022	.056	.978	.112	.099	1.119
Engineering	-.478****	.052	.620	-.361****	.068	.697
Mathematics & Statistics	-.348***	.133	.706	-.568***	.209	.567
Class Standing	-.303****	.036	.738	-.143**	.063	.867
Gender	.440****	.033	1.558	.506****	.042	1.658
Physical Sciences x Class				-.382*	.217	.682
Biological Sciences x Class				-.335****	.125	.715
Engineering x Class				-.196	.124	.822
Mathematics & Statistics x Class				.688**	.317	1.990
Physical Sciences x Gender				.262	.192	1.299
Biological Sciences x Gender				-.066	.116	.936
Engineering x Gender				-.244**	.116	.783
Mathematics & Statistics x Gender				.121	.269	1.129
Class Standing x Gender				-.178**	.076	.837
Constant	.028	.028	1.028	-.021	.033	.979

* p<.10; ** p<.05; *** p<.01; **** p<.001

Table 4a. Significant Interaction of Gender and Class – Percentage of Students Intending to Study Abroad

	Freshmen	Sophomore
Female	61.0%	52.0%
Male	47.2%	42.0%

Table 4b. Significant Interaction of Gender and Class – Odds of Intending to Study Abroad

	Freshmen	Sophomore	Odds Ratio
Female	1.244	1.083	1.149
Male	.894	.724	1.234
Odds Ratio	1.393	1.496	

Discussion and Implications

The results of this study shed light on the interaction of three important variables that predict U.S. students' intent to study abroad – major, gender, and class standing. Within the field of higher education, student affairs professionals are tasked with promoting the learning and development of all students, making it imperative to understand how and why certain students participate in various engagement activities. The results of this study point to key factors that influence students' intent to engage in study abroad, and as noted by Stroud (2010), understanding intent is the first step in promoting increased participation in study abroad. By understanding the study abroad intent of those in STEM majors, student affairs professionals can target specific interventions to increase those students' participation.

The main effects found in the logistic regression analysis are unsurprising and parallel actual participation numbers – those students in the U.S. who participate in study abroad in higher numbers (women and non-STEM majors) had greater odds of intending to study abroad overall. The findings from this study differ than those from Salisbury et al.'s (2009) findings that majoring in

STEM fields was not a significant predictor of intent to study abroad. This difference in findings may be due to differences in the student populations sampled in each study. Salisbury et al. used data from the Wabash National Study of Liberal Arts Education; as such, the majority of the institutions in the study are liberal arts colleges. The NSLLP, on the other hand, is dominated by large research universities. It is likely that the types of students entering STEM majors, and the types of STEM major environments they encounter, are substantially different at these different types of universities. In fact, Salisbury et al. found that attending a research university overall was a significant negative predictor of intent to study abroad. The combination of these two studies points to the need to examine patterns of intent to study abroad at different types of institutions, particularly when considering differences based on academic major.

The results of the effect of class standing are consistent with the existing literature on intent to study abroad. The odds of intending to study abroad were greater for freshman than for sophomores in this study, consistent with previous findings that the number of college-bound high school

Table 5a. Significant Interactions of Major and Class – Percentage of Students Intending to Study Abroad

	Freshmen	Sophomore
Biological Sciences	59.2%	52.0%
Mathematics and Statistics	45.5%	42.0%
Physical Sciences	43.6%	31.7%
Non-STEM	57.1%	51.1%

Table 5b. Significant Interactions of Major and Class – Odds of Intending to Study Abroad

	Freshmen	Sophomore	Odds Ratio
Biological Sciences	1.451	.795	1.824
Mathematics and Statistics	.835	1.114	.749
Physical Sciences	.773	.464	1.666
Non-STEM	1.331	1.045	1.273

Table 6a. Significant Interactions of Major and Gender – Percentage of Students Intending to Study Abroad

	Female	Male
Engineering	39.9%	35.3%
Non-STEM	55.4%	45.0%

Table 6b. Significant Interaction of Major and Gender – Odds of Intending to Study Abroad

	Female	Male	Odds Ratio
Engineering	.664	.546	1.216
Non-Stem	1.215	.818	1.485

seniors who say they plan to study abroad is much greater than the number who actually do (ACE, 2008; IIE, 2010). The fact that there is a significant difference in intent to study abroad between the freshmen and

sophomore years points to the possibility that something in the college environment may be discouraging students from studying abroad. As students spend more time in college, they become less likely to intend

to study abroad. This points to a key implication for student affairs professionals interested in promoting study abroad participation – if something in the academic environment is discouraging students from studying abroad, it is possible that interventions designed to encourage study abroad participation might offset this effect. For example, Salisbury et al. (2009) found that engagement in diversity-related activities was a positive predictor of first-year students' intent to study abroad. Student affairs professionals looking to promote study abroad might capitalize on existing diversity-related programs by explicitly talking with attendees about how to continue building on what they learned in the program through study abroad. Additionally, more research is needed to determine how and why students stop intending to study abroad. While much of the literature examines motivations of and outcomes for students who do study abroad, it is perhaps equally important to examine the experiences of those students who do not study abroad.

While the main effects in this analysis reaffirm existing research, this study contributes to the research on intent to study abroad in two important ways. First, the analysis of the interaction of class standing with major and gender begins to shed light on the complexities of how different college environments provided by different majors may influence students' intent to study abroad over time. For example, as freshmen, the odds of intending to study abroad are actually the same for biological sciences majors and their non-STEM peers, but the drop-off of intent to study abroad is steeper for biological sciences majors as they move into sophomore year. There may be something in the experiences of students in biological sciences that negatively influences their intent to study abroad over time, more so than students in non-STEM majors. This may be different than the experiences of physical sciences majors, who start off with lower odds of intending to study abroad, but also drop off more sharply than non-

STEM majors, or mathematics and statistics majors, for whom the odds of intending to study abroad for sophomores is actually greater than that for freshmen. College environments in general may be influencing men and women differently, as the significant interaction effect of class and gender indicates that women have a sharper drop-off of intent to study abroad than do men, across majors.

The effect of different majors on study abroad intent points to a number of possibilities for student affairs practitioners interested in promoting study abroad to partner with faculty and other counterparts in academic affairs. For example, student affairs professionals might connect with faculty and academic advisors in certain areas to target specific messages about study abroad to different populations of students. Additionally, student affairs professionals might create specific programs to give students majoring in areas like biological sciences to explore how study abroad can fit with their particular courses of study and contribute to their long-term academic and career development.

The second main contribution of this study to the understanding of intent to study abroad is the particular importance of considering different STEM majors separately. As noted above, the interaction of major with class was very different for students in different STEM majors, as was the interaction of major with gender (which was only significant for engineering majors). Considering STEM majors as a monolithic group would have missed the intricacies of these group differences. This is particularly important to consider for those looking to increase actual participation in study abroad. For example, student affairs professionals may need to look for ways to harness biological sciences students' initial interest in study abroad, while interventions targeted at physical sciences and engineering students may need to start earlier and focus on the benefits of study abroad, as these students show less interest from the begin-

ning. Similarly, practitioners may need to consider how to market programs differently to men and women.

The results of this study clearly point to the need for future research on what shapes U.S. students' intentions to study abroad and how those intentions change during college. It is particularly important to note that the number of sophomores in this study who indicated that they intended to study abroad was still much higher than the approximately 2% of students enrolled in higher education who actually do so. It is possible, even likely, that students who responded to this survey were more likely than the general population of U.S. students to study abroad, particularly as the NSLLP sampled from students in living-learning programs and a comparison group of students living in residence halls, all of whom are more likely than students not living in residence halls to participate in campus activities overall. For example, using data from the Multi-Institutional Study of Leadership, another national data set of college students in the U.S., Lee (2010) found that approximately 25% of seniors who completed the survey had studied abroad. Even if a similar number of students who responded to the NSLLP eventually went on to study abroad, there still seems to be a disconnect between intent and action. In fact, the overrepresentation of involved students in the NSLLP may indicate that this study actually overestimated students' intent to study abroad and underestimated group differences. The interaction of class standing with gender and some majors indicates that different students' intentions change differently, but little is known about the actual process of forming and maintaining intentions to study abroad. Additional quantitative studies exploring the interactions of class standing with other variables, such as socioeconomic status and race, along with qualitative studies exploring student's intentions in depth, would further illuminate this key issue in increasing and equalizing study abroad participation.

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